

New species of Indo-Pacific jawfishes (*Opisthognathus*: Opisthognathidae) from the Western Indian Ocean and Red Sea

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Submitted 6 April; accepted 29 April 2010

ABSTRACT. Descriptions of six new species of the jawfish genus *Opisthognathus* from the Western Indian Ocean are provided: *O. adelus* (South Africa and Madagascar); *O. afer* (Kenya to South Africa); *O. crassus* (Maldive Islands); *O. dipharus* (Red Sea); *O. longinarius* (South Africa); *O. simus* (Cargados Carajos). All of these species are sufficiently distinct that no obvious Indo-West Pacific sister-species are apparent. An identification key and summary table of selected characters are provided for all species of *Opisthognathus* known from the Western Indian Ocean.

RÉSUMÉ. Les descriptions de six nouvelles espèces du genre *Opisthognathus* de la partie Ouest de l'Océan Indien sont : *O. adelus* de l'Afrique du Sud et du Madagascar ; *O. afer* (du Kenya à l'Afrique du Sud) ; *O. crassus* (Des îles Moldavies) ; *O. dipharus* (de la Mer rouge) ; *O. longinarius* (Afrique du Sud) ; *O. simus* (Cargados). Toutes ces espèces sont si différentes qu'aucune espèce apparente de la famille soeur trouvée dans la partie Est de l'Océan indien n'est visible. Le mot-clé d'identification et le classement des caractères spécifiques sont donnés pour toutes les espèces *Opisthognathus* connues de la partie occidentale de l'océan indien.

KEYWORDS: Opisthognathidae, *Opisthognathus*, new species, Indian Ocean, South Africa, Red Sea

INTRODUCTION

The jawfish family Opisthognathidae is characterized by prominent upper jaws, large mouths, bulbous eyes, heads that usually lack scales, and a unique pelvic fin arrangement consisting of one spine and five segmented rays, the outer two unbranched and usually relatively thick. All jawfishes orally incubate their eggs and are obligatory burrow dwellers, using their large mouths to excavate and maintain their burrows. Forty-two species of jawfishes from the Indo-West Pacific Ocean (including the Red Sea) are currently recognized as valid with at least 34 others known that lack scientific names. Because of their fossorial behavior and relatively poorly sampled habitats, new species of opisthognathids continue to be discovered.

The primary purpose of this publication is to provide descriptions of six new species of *Opisthognathus* from the region (Fig. 1), so their scientific names will be available for inclusion in a soon-to-be published book on the coastal fishes of the Western Indian Ocean. Prior to description of *Opisthognathus margaretae* (Smith-Vaniz 1983) from southern Africa and Madagascar only two other species of *Opisthognathus* Cuvier were known from the Red Sea or Western Indian Ocean: *O. nigromarginatus* Rüppell (1830) and *O. muscatensis* Boulenger (1887). Expanded accounts and illustrations of the latter two species were given by Smith-Vaniz (2009) together with description of a fourth Indian Ocean species, *O. variabilis*, known from the Maldive Islands and Sri Lanka eastward to Palau.

Stalix Jordan and Snyder, another jawfish genus, also occurs in the region and is represented by two species. *Stalix omanensis* Norman (1939), from the Gulf of Oman — known only from the holotype trawled in 73 m, and *S. davidsheni* Klausewitz (1985), represented by two specimens collected in 9–17 m from the Gulf of Aqaba. Both species were redescribed by Smith-Vaniz (1989) and, based on the distributions of the 11 species recognized in that revision (and others subsequently discovered), it is likely that additional species of *Stalix* occur in the Western Indian Ocean. *Stalix* differs from *Opisthognathus* and all other fish genera in having the first 5–9 dorsal-fin spines transversely forked distally and the skin covering them forming a broad dorsal hood to accommodate the uniquely shaped spines.

The infraorbital bones are quite different in some species of *Opisthognathus* that occupy similar habitats and depth ranges, and thus may prove useful in inferring relationships. Illustrations of the infraorbitals of selected Western Indian Ocean species are given here for comparison (Fig. 2), but a phylogenetic analysis of Indo-Pacific jawfishes is beyond the scope of this study. An identification key and summary of selected characters (Table 1) are provided for all 10 species of *Opisthognathus* now known from the Western Indian Ocean to aid in recognition of the new species described herein. Because *O. variabilis* exhibits considerable geographic variation, meristic data for this species are based only on Indian Ocean specimens.

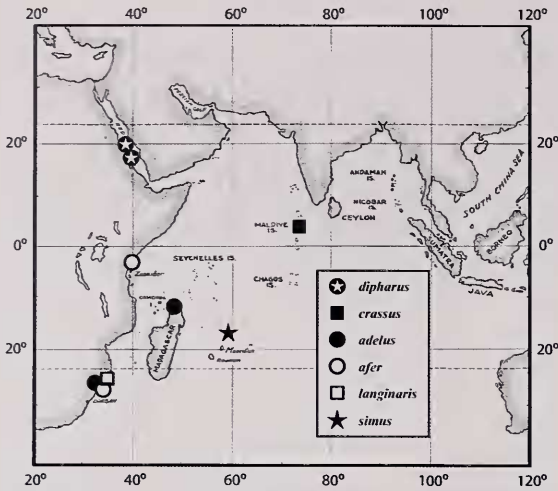


Fig. 1. Known distributions of new species of *Opistognathus* described herein. Collections from closely adjacent localities are represented by single symbols.

MATERIALS AND METHODS

Abbreviations used for institutional depositories are as follows: Academy of Natural Sciences of Philadelphia (ANSP); Bernice P. Bishop Museum, Honolulu (BPBM); Hebrew University, Jerusalem (HUJ); Royal Ontario Museum, Toronto (ROM); South African Institute of Aquatic Biodiversity, Grahamstown (SAIAB); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

Detailed methods of counts and measurements are given in Smith-Vaniz (2009) and only some that might otherwise be unclear are repeated here. The last two elements in the dorsal and anal fins have their bases in close approximation ('split to base' condition) and were counted as one ray in accord with the general practice of most authors, although the ultimate element has a separate rudimentary pterygiophore or stay. The short, dorsalmost element in the pectoral fin is included in the ray counts. Vertebral counts from radiographs are presented as a formula: precaudal + caudal = total count. When the lateral line ends approximately mid-way between two dorsal-fin elements, the number was rounded and the higher value tabulated in Table 5. The number of oblique scale rows is only an approximation due to the irregular size and arrangement of individual scale rows. Included in this count are all anteroventrally aligned scale rows in a longitudinal series from above the tip of the opercular flap to the base of the caudal fin (counts of posteroventrally aligned scale rows result in lower

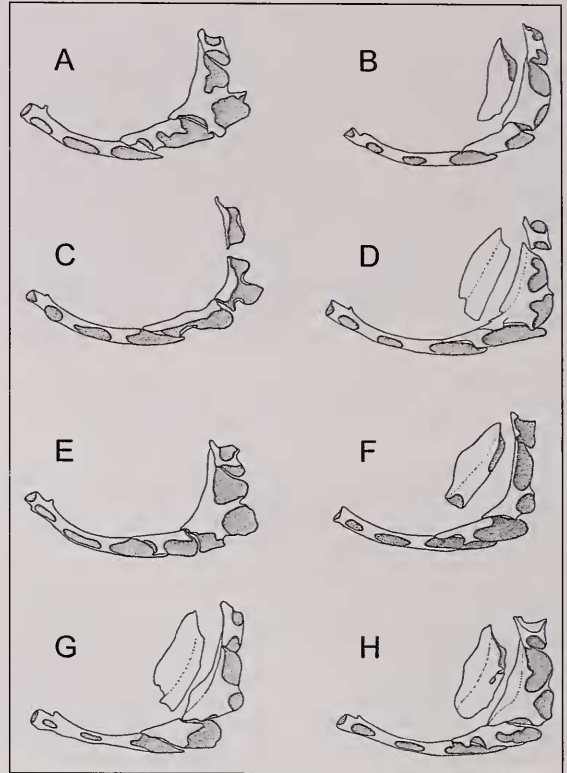


Fig. 2. Lateral views of infraorbitals, anterior to the right (3rd infraorbital also rotated in dorsal view), excluding dermosphenotic, in selected species of *Opistgnathus*: A, *O. adelus*, SAIAB 39747, 49.6 mm SL, South Africa; B, *O. afer*, SAIAB 7601, 39.1 mm SL, Kenya; C, *O. crassus*, BPBM 32706, 35.5 mm SL, Maldives Islands; D, *O. dipharus*, HUJ E62/3685, 47.2 mm SL, Red Sea; E, *O. longinarius*, SAIAB 39747, 41.0 mm SL, South Africa; F, *O. margaretae*, ANSP 149352, 50.7 mm SL, South Africa; G, *O. muscatensis*, SAIB 7602, 133 SL, Seychelles; H, *O. simus*, ANSP 167418, 49.2 mm SL, Cargados Carajos.

values). In some cases number of scale rows and gill rakers were counted on both the left and right sides of specimens and recorded separately in the text and Tables 3 and 4. Detection of cephalic sensory pores was facilitated in some specimens by staining with a cyanine blue solution (Saruwatari et al. 1997). Specimen sizes are given as mm standard length (SL), and parenthetical expressions give number of specimens, if more than one, followed by the size range. Cleared and stained specimens are indicated as 'C&S'. In cases where whole C&S specimens were unavailable, the right infraorbital and jawbones were dissected and stained, and drawings of them are shown in reverse to facilitate comparisons with other species whose left bones are illustrated.

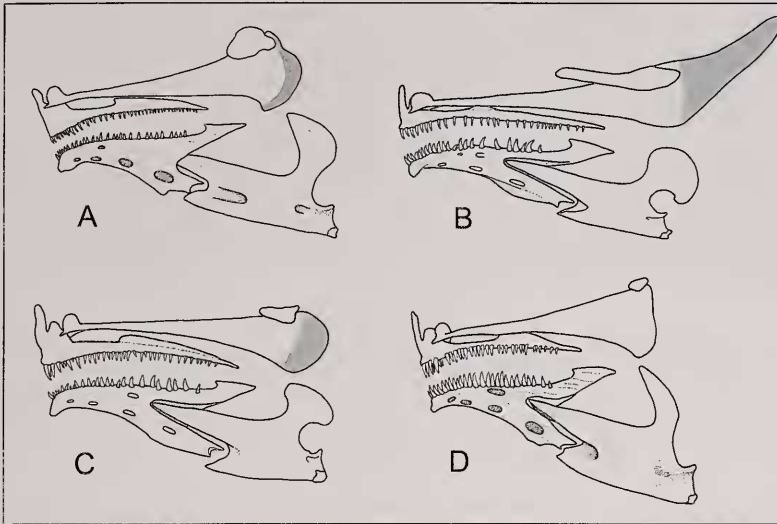


Fig. 3. Upper and lower jaws (thin flexible part of maxilla shaded) in selected species of *Opisthognathus*: A, *O. adelus*, SAIAB 39747, female, 49.6 mm SL, South Africa; B, *O. nigromarginatus*, ANSP 143892, female, 122 mm SL, India; C, *O. muscatensis*, SAIAB 7602, male, 133 mm SL, Seychelles; D, *O. margaretae*, ANSP 149352, male, 50.7 mm SL, South Africa.

Table 1. Summary of selected characters in Western Indian Ocean species of *Opisthognathus* (exceptional values in parentheses).

Characters	<i>Opisthognathus</i> species									
	<i>crassus</i>	<i>afer</i>	<i>adelus</i>	<i>margaretae</i>	<i>dipharus</i>	<i>simus</i>	<i>longinaris</i>	<i>muscatensis</i>	<i>nigromarginatus</i>	<i>variabilis</i>
Dorsal fin	XI, 11	XI, 13-14	XI, 13-14	XI, 13-14	XI, 15	XI, 15	X, 20	XI, 15	XI, 14 (15)	XI, 15
Anal fin	II, 10	III, 12-14	III, 13-14	III, 13-14	III, 16	III, 15-16	III, 19	III, 15	III, 14 (15)	III, 15
Caudal vertebrae	16	17-18	17-18	18	19	19	24	19	18	19
Hypural 5 present	yes	no	no	yes	no	no	no	no	no	no
Supraneural bones	2	0	1	1	0	1	0	1	1	1
Total gill rakers	34	22-23	24-25	26-29	28	27-28	23-25	36-44	39-45	31-37
Oblique scale rows	44	58-62	40-41	38-52	63-64	53-62	40-42	103-128	68-95	75-79
Lateral line ends below										
segmented ray	2	2-4	3-4	(3) 4-6	6-7	6	8	(4) 5-7	4-6	4-6
Cirrus on anterior nostril	no	no	yes	yes	yes	yes	yes	no	no	no
Vomerine teeth	no	yes	no	no	no	no	no	no	no	no
Maxilla fimbriate posteriorly	no	no	yes	no	no	no	no	yes (slight)	yes	yes
Under side of upper jaw with										
dark blotch or stripe	no	no	blotch	blotch	blotch	blotch	blotch	no	2 stripes	1 stripe
Area around esophageal opening										
or inside of mouth partly dark	no	yes	no	no	no	no	yes	no	yes	yes
Dorsal fin with ocellus	no	no	no	yes	no	no	no	yes	yes	no
Dorsal-fin spine tips with										
pale, fleshy tabs	yes	yes	no	no	no	no	no	no	no	no

KEY TO SPECIES OF *OPISTHOGNATHUS* OF THE WESTERN INDIAN OCEAN

- 1a. Dorsal fin with ocellated spot between third or fourth and eighth spines followed by two large, irregular, dark blotches that extend onto body; outermost segmented pelvic-fin ray tightly bound to adjacent ray, and interradiial membrane not incised distally or only slightly at tip (Persian Gulf, Seychelles and East African coast) *O. muscatensis* Boulenger
- 1b. Colour pattern not as above; outermost segmented pelvic-fin ray not tightly bound to adjacent ray, and interradiial membrane distinctly incised distally 2
- 2a. Posterior end of upper jaw with a flexible lamina (Figs. 3 A-C)..... 3
- 2b. Posterior end of upper jaw rigid, without a flexible lamina (Fig. 3D) 5

- 3a. Lower limb and total gill rakers 15 or 16 and 24 or 25, respectively, in adults; body with about 40-44 oblique scale rows; supramaxilla relatively wide and oval-shaped (southern Africa and Madagascar) ... *O. adelus*, n. sp.
- 3b. Lower limb and total gill rakers 20-29 and 31-45, respectively, in adults; body with about 68-95 oblique scale rows; supramaxilla relatively slender and elongate 4
- 4a. Dorsal fin with prominent ocellus between spines 4-8; caudal fin usually with a pair of pale basicaudal spots; lower limb gill rakers typically 23-29 (Persian Gulf, Red Sea and western Indian Ocean to South China Sea) *O. nigromarginatus* Rüppell
- 4b. Dorsal fin without an ocellus; caudal fin without a pair of pale basicaudal spots; lower limb gill rakers 31-37 (Maldive Islands to Palau) *O. variabilis* Smith-Vaniz
- 5a. Oral membrane between dentaries and "tongue" dark brown; tentacle on anterior nostril at least 4 times maximum diameter of posterior nostril; segmented dorsal- and anal-fin rays 20 and 19, respectively; caudal vertebrae 24 (southern Africa) *O. longinaris*, n. sp.
- 5b. Oral membrane between dentaries and "tongue" pale; tentacle on anterior nostril about 0.5-2.0 times maximum diameter of posterior nostril; segmented dorsal- and anal-fin rays 11-15 and 10-16, respectively; caudal vertebrae 16-18 6
- 6a. Segmented dorsal- and anal-fin rays 11 and 10, respectively; spinous dorsal fin with dark blotches interspaced by sharply defined, pale interspaces nearly as wide as blotches; depth at anal-fin origin 26 % SL (Maldive Islands) *O. crassus*, n. sp.
- 6b. Segmented dorsal- and anal-fin rays 13-15 and 12-16, respectively; colour pattern of dorsal fin not as above; depth at anal-fin origin 15-20 % SL 7
- 7a. Dorsal fin with an ocellated spot between 3rd and 5th spines; body usually naked anterior to vertical below last dorsal-fin spine (southern Africa and Madagascar) *O. margaretae* Smith-Vaniz
- 7b. Dorsal fin without an ocellated spot; body naked anterior to vertical below 5th or 6th dorsal-fin spines 8
- 8a. Segmented dorsal- and anal-fin rays 13 or 14 and 12-14, respectively; anterior nostril without a cirrus; dorsal-fin spines moderately stout and straight distally, with slightly swollen fleshy tabs on tips; vomerine teeth 2 or 3; lateral-line terminus below verticals from 2nd to 4th segmented dorsal-fin rays (southern Africa) *O. afer*, n. sp.
- 8b. Segmented dorsal- and anal-fin rays 15 and 15 or 16, respectively; anterior nostril with a slender cirrus; dorsal-fin spines relatively slender and curved distally with flexible tips lacking swollen fleshy tabs; vomerine teeth absent; lateral-line terminus below verticals from 6th or 7th segmented dorsal-fin rays 9
- 9a. Caudal fin with pair of conspicuous basicaudal spots; spinous dorsal fin with a row of pale mid-lateral spots; no supraneural bones (Red Sea) *O. dipharus*, n. sp.
- 9b. Caudal fin without a pair of conspicuous basicaudal spots; spinous dorsal fin without a row of pale mid-lateral spots; 1 supraneural bone (Carados Carajos) *O. simus*, n. sp.

Opistognathus adelus sp. nov.

Obscure jawfish
Figs. 4-6

Holotype. SAIAB 49583, male (47.0), Madagascar, off Nosy Tanga, W coast of Nosy Bé, 13°23'S, 48°11'E, 5-10 m, silty sand, P. C. Heemstra and D. A. Hensley, 7 September 1995.

Paratypes: 4 specimens, 21.0-48.9 mm SL. SAIAB 54745, largest gravid female (3, 21.0-48.9) and USNM 372769, gravid female (46.2), taken with the holotype.

Other material: SAIAB 39747, female (49.6), South Africa, Kwazulu, Kosi mouth area, 26°53'S, 32°55.8'E, dredged in 65 m, R. N. Kilburn, 7 June 1987, R/V Meiring Naude.

DIAGNOSIS. A species of *Opistognathus* with the following combination of characters: upper jaw broadly rounded with a large oval-shaped supramaxilla, and maxilla with a flexible lamina posteriorly; dorsal-fin rays XI, 13 or 14; posterior angle of jaws, including inner lining of maxilla and adjacent membranes with dark blotch; dorsal fin without ocellus or large dark blotches; vomerine teeth absent.

DESCRIPTION. (Counts for holotype given in parentheses if different from any of the other specimens.) Dorsal-fin rays XI, 13 or 14 (14). Anal-fin rays III, 13 or 14 (14). Pectoral-fin rays 18 or 19 (18). Caudal fin: procurrent rays 3-4 + 3-4, segmented rays 8 + 8, middle 13 or 14 branched, total elements 22 or 24; hypural 5 absent. Vertebrae: 10 + 17 or 18 (17)

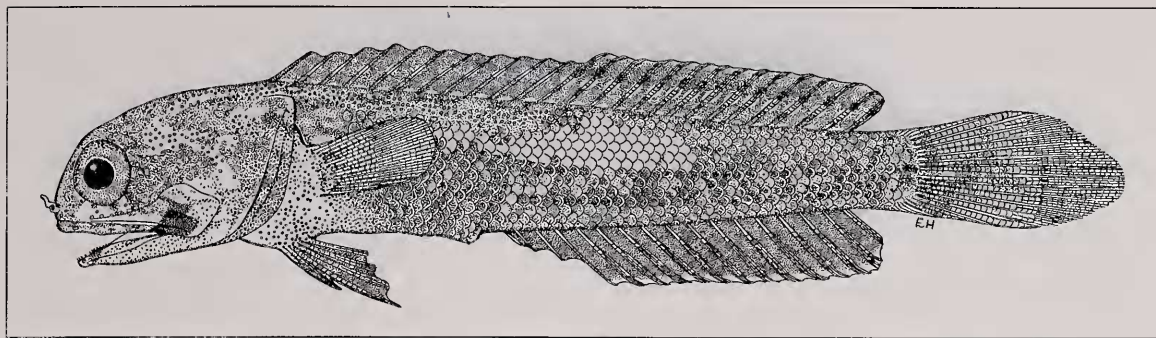


Fig. 4. *Opisthognathus adelus*, holotype, SAIAB 49583, male, 47.0 mm SL, Madagascar, west coast of Nosy Be. Drawn by Elaine Heemstra.

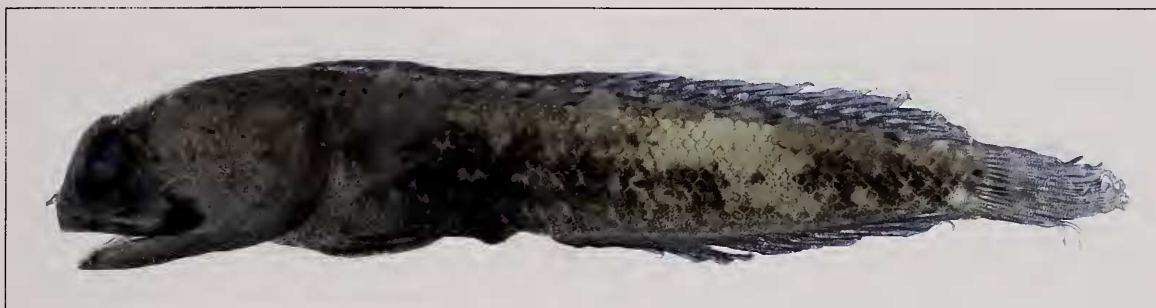


Fig. 5. *Opisthognathus adelus*, holotype (after preservation in alcohol). Photograph by Richard T. Bryant.

only in South Africa specimen); last rib on vertebra 10; epineurals 10. A single supraneural bone inserted between neural spines 1–2. Gill rakers 9 + 15 or 16 (15), except 6 + 14 in two small juveniles, 21.0–23.0 mm SL.

Scales absent on head and body anterior to vertical from 6th dorsal-fin spine, and from area above and below lateral line, pectoral-fin base and anterior one-third of belly. Body with about 40 or 41 oblique scale rows. Lateral-line ends below vertical between 2nd to 4th segmented dorsal-fin rays, total element position 13–15. Lateral-line pores numerous, arranged in multiple series along embedded lateral-line tubes. Cephalic sensory pores relatively numerous (Fig. 6), completely covering nape except for small area adjacent to dorsal-fin origin; dentary pore positions 1–2 with relatively large, single pores, 3rd position with 1–3 (1) pores, 4th with 2–5 (2) pores, 5th with 8–18 (8) pores; all preopercular pore positions with multiple pores.

Anterior nostril slightly closer to posterior nostril than to dorsal margin of upper lip, and with a simple tentacle on posterior rim that when depressed extends slightly beyond orbital margin; length of tentacle about 2 times maximum of diameter of posterior nostril. Dorsal fin very low anteriorly gradually increasing in height posteriorly; profile relatively uniform with slight change in fin height at junction of spinous and segmented rays. Dorsal-fin spines slender and straight or slightly curved distally

with flexible tips; all segmented dorsal- and anal-fin rays branched distally. Outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally. Posterior margin of preopercle distinct with free margin. No papillae on inner surface of lips. Fifth cranial nerve passes under A1 β section of adductor mandibulae.

Upper jaw extends 1.0 to 1.2 eye diameters behind posterior margin of orbit; maxilla widest before end, then canted downward and rounded, with flexible lamina posteriorly (Fig. 3A); supramaxilla large, oval-shaped and subterminally positioned. Premaxilla with an outer row of moderate, sharply pointed teeth that become progressively smaller posteriorly; 2 or 3 inner rows of smaller, conical teeth anteriorly, except several on each side of symphysis somewhat enlarged and canted backwards. Dentary with an outer row of moderate conical teeth, largest mid-laterally; 2 or 3 irregular inner rows of smaller conical teeth anteriorly, several slightly canted backwards. Vomerine teeth absent. Infraorbital bones tubular with wide openings for sensory canals (Fig. 2A), 3rd infraorbital relatively robust without suborbital shelf.

Measurements of three paratypes, 46.2–49.6 mm, and the 47.0 mm holotype (in parentheses), as percent of SL: predorsal length 29.8–31.0 (31.3); preanal length 54.6–57.9 (53.8); dorsal-fin base 63.1–73.9 (68.7); anal-fin base 36.5–40.0 (41.3); pelvic-fin length 16.8–18.2 (18.9); caudal-fin length 20.5–21.6

(21.1); depth at anal-fin origin 13.8–14.9 (15.1); caudal-peduncle depth 7.7–8.1 (7.9); head length 29.5–31.4 (31.5); postorbital-head length 20.2–20.6 (20.9); upper-jaw length 18.7–19.9 (21.5); postorbital-jaw length 8.4–10.6 (11.7); orbit diameter 8.7–9.5 (9.7). As percent of head length: postorbital-head length 64.8–68.6 (66.2); upper-jaw length 62.6–63.5 (68.2); postorbital-jaw length 28.3–34.4 (37.2); orbit diameter 29.4–30.3 (30.7).

Preserved colouration of holotype (life colouration unknown): head and body primarily tan, but naked areas of body, including pectoral-fin base, heavily freckled with discrete chromatophores; naked area of body above and beneath pectoral fin with a few pale spots; upper lip with dark bands and inner lining of upper jaw and adjacent membranes with posterior black blotch that is externally visible (Fig. 7A); inside of mouth pale; branchiostegal membranes dark brown and orbital rim with small brown spots; dorsal fin mostly tan but soft portion of fin with a row of faint brown spots centered on each ray below which is a row of slightly larger pale spots, and its base with five evenly spaced faint, dark blotches; pelvic and anal fins dark, the latter with pale margin; caudal fin without bands and with small, narrow, dark blotch (not evident in the illustrations) between pair of indistinct pale basicaudal spots.

In preservation, females differ primarily from male holotype in having paler pelvic fins.

DISTRIBUTION. South Africa and northwest Madagascar (Fig. 1) in 5–65 m.

ETYMOLOGY. The specific epithet is from the Greek *adelos* (dim or obscure), in reference to the uncertain phylogenetic relationships of this jawfish.

REMARKS. The single South African specimen differs from the five Madagascar specimens in having one fewer caudal vertebra and one fewer segmented ray in both the dorsal and anal fins. This specimen is slightly larger than the others and has more dentary pores. The following counts are left and right side values for the 49.6 mm South African specimen followed, in parentheses, by range values for the three largest (46.2–48.9 mm) Madagascar specimens: 3rd dentary position 2/3 (1); 4th position 5/4 (2–4); 5th position 18/16 (8–12). These differences in number of pores are assumed to be within the normal range of variation, especially considering the few available specimens. Specimens from the two localities have essentially identical colour patterns and jaw morphologies and, despite the meristic differences (reductions in numbers of vertebrae and fin rays are often correlated in jawfishes), are here considered to be conspecific. Because of the possibility that two allopatric sister-species are actually represented, the South African specimen is not designated as a paratype.

The combination of an upper jaw with flexible lamina posteriorly and large oval-shaped supramaxilla in *O. adelus* is shared only with *O. iyonis* (Jordan and Thompson 1913), known only

from Japan and Korea, but the two species differ in so many other characters, including very different colour patterns, that a sister-group relationship seems very unlikely.

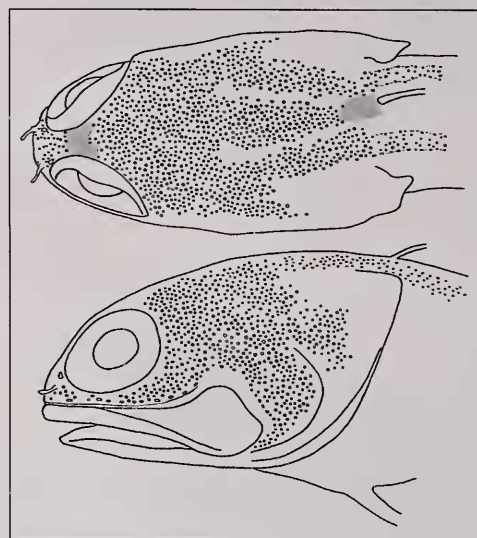


Fig. 6. Cephalic sensory pores of *Opistognathus adelus*, holotype (reversed right side view). Shaded areas indicate damaged regions of head where pores could not be accurately depicted.

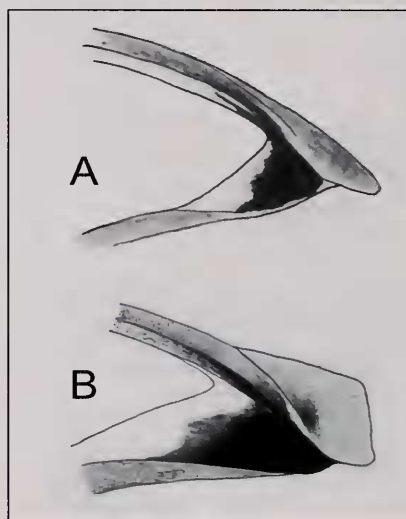


Fig. 7. Lateral views of partially rotated left jaws to show dark pigment on inner lining of maxilla and adjacent membranes (dorsal margin of maxilla is a top of figures): A, *Opistognathus adelus*, SAIAB 39747, female, 49.6 mm SL, South Africa; B, *O. simus*, USNM 315659, male, 55.0 mm SL, Cargados Carajos.



Fig. 8. *Opisthognathus afer*, holotype, SAIAB 39994, male, 41.2 mm SL, South Africa, Maputoland Reef (Phillip C. Heemstra).



Fig. 9. *Opisthognathus afer*, SAIAB 42789, gravid female, 37.3 mm SL, Mozambique, Ponta Malongane (Phillip C. Heemstra).

Opisthognathus afer sp. nov.

African jawfish
Figs. 8–10

Holotype. SAIAB 39994, male (41.2), South Africa, Maputoland Reef, 2 km south of Kosi mouth, 26°54'S, 32°53'E, 31 m, bottom, bedrock, sand and gravel, rotenone, C. Buxton, P.C. Heemstra, W. Holleman, R. Tilney and T. Andrew, 9 August 1992.

Paratypes: 4 specimens, 21.7–41.3 mm SL. **Mozambique:** SAIAB 42789, gravid female (37.3), Ponta Malongane, 26°46'44"S, 32°54'14"E, 22–25 m, P. C. Heemstra, T. Andrew and A. Wood, sta. PCH 95-04, 2 November 1995. **South Africa:** SAIAB 56415, gravid female (41.3) and USNM 368139, gravid female (37.7), Sodwana Bay, 27°32'1"S, 32°41'13"E, 30–32 m, sand and scattered sponges, P.C. Heemstra, D. Polack, S. Polack and J. Dench, sta. KZN FW97-01, 12 August 1997; ROM 72836, female (21.7), ESE of Sodwana Bay, S. of Uniform Reef, 27°30'10"S, 32°42'07"E, 28–30 m, R. Winterbottom et al., 15 May 2001.

Other material: SAIAB 7601, gravid female (39.1), Kenya, Shimoni, 4°39'S, 39°23'E, J.L.B. and M. M. Smith, 21 November 1952.

DIAGNOSIS. A species of *Opisthognathus* with the following combination of characters: maxilla rigid, without flexible lamina posteriorly; dorsal-fin rays XI, 13 or 14; body and dorsal fin with one or more horizontal rows or series of pale spots; tips of spines with conspicuously pale fleshy tabs; all dentary-preopercular pore positions with single pores; vomerine teeth 2 or 3.

DESCRIPTION. (Counts for holotype given in parentheses if different from any of the paratypes.) Dorsal-fin rays XI, 13–14 (13). Anal-fin rays III, 12–14 (13). Pectoral-fin rays 19–20 (19). Caudal fin: procurrent rays 5–6 (4) + 4–6 (4), segmented rays 8 + 8, middle 13 (12) branched, total elements 25–26 (24); hypural 5 absent. Vertebrae: 10 + 17 or 18 (18 only in Kenya specimen); last rib on vertebra 10; epineurals 12. Supraneural bones absent. Gill rakers 8 + 14–15 (15).

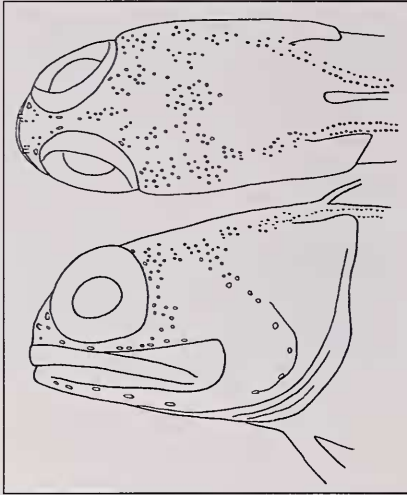


Fig. 10. Cephalic sensory pores of *Opisthognathus afer*, holotype (reversed right side view).

Scales absent on head and body anterior to a vertical from 3rd to 4th dorsal-fin spine, and from area above lateral line, pectoral-fin base, breast and anterior half of abdomen. Body with about 58–62 oblique scale rows in longitudinal series (scale rows very irregular anteriorly making it difficult to make precise counts). Lateral line ends below verticals between 2nd to 4th segmented dorsal-fin ray, total element position 13–14.5 (14). Lateral-line pores sparse, mostly arranged in a single row above and below embedded lateral-line tubes. Cephalic sensory pores relatively sparse (Fig. 10); all dentary-preopercular pore positions with single pores.

Anterior nostril positioned slightly closer to posterior nostril than to dorsal margin of upper lip, and consisting of a moderate tube that when depressed does not reach or just reaches margin of posterior nostril; height of tube slightly longer than maximum diameter of posterior nostril. Dorsal fin moderately low, profile of fin with slight increase in height at junction of spinous and segmented rays, profile of fin gradually increasing in height posteriorly. Dorsal-fin spines moderately stout, straight and pungent distally, with slightly swollen fleshy tabs on tips; all segmented dorsal- and anal-fin rays usually branched distally (first 2 anal rays unbranched in smallest paratype). Outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradiar membrane incised distally. Posterior margin of preopercle distinct, with slight free margin. No papillae on inner surface of lips. Fifth cranial nerve passes over A1 β section of adductor mandibulae.

Upper jaw extends about 0.5–0.75 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, relatively small and terminally positioned. Premaxilla with outer row of moderately small, conical teeth that become progressively

smaller posteriorly; 1 or 2 irregular rows of teeth behind outer row anteriorly, including 3 or 4 slightly enlarged teeth on each side of symphysis that are almost horizontally aligned. Dentary teeth similar to those of premaxilla except 1–3 rows of teeth behind outer row on anterior half of each dentary, those in innermost row canted backwards. Vomerine teeth 2 or 3. Infraorbital bones tubular with wide openings for sensory canals (Fig. 2B), 3rd infraorbital only slightly robust and without suborbital shelf.

Measurements of four paratypes, 37.3–41.3 mm, and the 42.1 mm holotype (in parentheses), as percent of SL: predorsal length 32.7–35.9 (33.7); preanal length 58.6–60.5 (59.6); dorsal-fin base 61.4–69.4 (64.6); anal-fin base 31.6–34.6 (33.0); pelvic-fin length 23.9–26.1 (24.0); caudal-fin length 23.2–23.4 (23.5); depth at anal-fin origin 16.2–20.1 (19.4); caudal-peduncle depth 9.6–10.9 (10.4); head length 9.9–10.9 (10.4); postorbital-head length 21.6–22.8 (23.5); upper-jaw length 17.4–19.8 (20.3); postorbital-jaw length 5.5–6.5 (7.8); orbit diameter 10.9–11.7 (10.2). As percent of head length: postorbital-head length 62.0–63.2 (63.6); upper-jaw length 50.9–54.0 (54.8); postorbital-jaw length 15.9–18.4 (21.0); orbit diameter 31.7–33.0 (27.5).

Preserved colouration of male holotype: background colour of head and body brown, speckled with random small white spots and larger ones arranged in distinct patterns; body with two rows of six large, irregular, pale spots, the upper row slightly below dorsal fin extending from above pectoral fin to end of fin and the other one from beneath lower part of pectoral fin to rear of anal fin; large pale spot also on lower half of pectoral-fin base and a smaller one just above upper base of fin; head with prominent pale spots behind end of upper jaw, on angle of preopercle, on opercle opposite preopercular spot, and a larger one across middle of opercle; upper lip with alternating brown and white bands, and middle of upper jaw with large brown band bordered posteriorly by a double white spot constricted in its middle; under side of upper jaw pale, except membrane connecting dorsal margin of maxilla to head and immediately adjacent internal sides of mouth brown; iris dark brown; dorsal and anal fins dark brown with several rows of white spots, the row nearest base of fin with the largest spots; spinous dorsal fin also with an isolated larger white spot anteriorly on spines 3–5 that touches dorsum; all spine tips with white fleshy tabs; caudal fin dark brown anteriorly with a pair of basicaudal white spots, otherwise fin light brown with 4 or 5 irregular bands of small white spots; pelvic fin very dark.

Preserved colouration of females: pale spots on head, body and caudal fin essentially the same as in males (except Mozambique females with lower row of body spots with six or seven large white spots instead of 6); dorsal fin with dark area above ventral row of white spots more intense and appearing as a black submarginal stripe; anal fin with series of unevenly distributed white spots along base of fin superimposed on a dark basal stripe with remainder

of fin mostly pale except for an irregular row of dark diagonal stripes; pelvic fin partially pale with dark bands.

Colour of holotype (Fig. 8) when fresh: head and body various shades of yellowish-tan to dark brown superimposed with pale yellow or white spots; dark blotches or bands on lips and upper jaw dark brown; lower part of cheek, opercle and gill membranes also dark brown; iris dark brown; all spots on fins are white; except for these spots, the dorsal and anal fins are dark brown with distal two thirds of soft portion of fins much lighter brown; caudal fin dark brown only in area around pair of white basicaudal spots; pelvic fin essentially black.

Mature females (Fig. 9) differ from males primarily in having background colour of head and body brownish-purple; submarginal stripe in the dorsal fin black; shafts of segmented dorsal and caudal rays yellowish, broken by three small white spots variably positioned along each shaft; iris reddish. Colour observations were available for only one individual of each sex so some differences in life colouration (but not the colour pattern - see above) possibly reflect only individual variation.

DISTRIBUTION. Coastal areas from Kenya to South Africa (Fig. 1) in 22–32 m.

ETYMOLOGY. The specific epithet is from the Latin *afer* (African), refers to the type locality. The name is treated as a noun in apposition.

REMARKS. Because the Kenyan specimen, tentatively identified as *O. afer*, differs from the others in having one additional caudal vertebra (and its colour pattern is poorly preserved), it is not designated as a paratype. However, I believe it is premature to recognize this single specimen as a different new species. Additional material is required for confirmation of the taxonomic status of the Kenyan population. The large distribution gap between the Kenyan and Mozambique localities could be only a collecting artifact as jawfishes are difficult to sample, exacerbated by their fossorial habits, and much of this area of the African coast is poorly surveyed.

No other species of jawfish has such a distinctive pattern of pale head and body spots as *Opisthognathus afer*. Other species of *Opisthognathus* with maxilla that are rigid without flexible lamina posteriorly also differ from *O. afer* either in having only 2 anal-fin spines (most species) or have more segmented dorsal- and anal-fin rays and caudal vertebrae, except *O. margaretae* and *O. rosenbergii* (Bleeker) which differ in having extremely numerous cephalic sensory pores, dorsal fins with prominent ocelli and more total gillraker (26–35 vs. 22 or 23).

Opisthognathus crassus sp. nov.

Stout jawfish

Figs. 11–13

Opisthognathus sp. Randall and Anderson, 1993: 36 (listed in checklist of Maldive Islands fishes).

Holotype (only known specimen): BPBM 32706, male (35.5), Maldive Islands, Ari Atoll, reef N. of Bathala Islands, E. side, 35 m, rubble bottom, rotenone, J.E. Randall and M. Shiham Adam, 6 March 1988.

DIAGNOSIS. A species of *Opisthognathus* with the following combination of characters: maxilla rigid without flexible lamina posteriorly; dorsal-fin rays XI, 11; anal-fin rays II, 10; tips of dorsal-fin spines conspicuously pale; dorsum with row of 5 dark blotches, some of which extend distinctly onto dorsal fin; last blotch on dorsal fin much narrower than anterior blotches.

DESCRIPTION. Dorsal-fin rays XI, 11. Anal-fin rays II, 10. Pectoral-fin rays 19. Caudal fin: procurent rays 4 + 4, segmented rays 8 + 8, middle 12 branched, total elements 24; hypural 5 present. Vertebrae: 10 + 16; last rib on vertebra 10; epineurals 14. Two supraneural bones, 1st supraneural inserted anterior to 1st neural spine, the 2nd between neural spines 1–2. Gill rakers 11 + 23.

Scales absent on head, nape, area above lateral line, and breast; a few deciduous scales present on pectoral-fin base. Body with about 44 oblique scale rows in longitudinal series. Lateral-line ends below vertical from 2nd segmented dorsal-fin ray, total element position 13. Lateral-line pores mostly arranged in an irregular series along embedded lateral-line tubes. Cephalic sensory pores relatively numerous (Fig. 13); dentary pore positions 1–4 with single pores, 5th position bipored; most preopercular pore positions bipored.

Anterior nostril about mid-way between posterior nostril and dorsal margin of upper lip, consisting of a short tube that when depressed just reaches anterior margin of posterior nostril; height of tube shorter than maximum diameter of posterior nostril. Dorsal fin moderately high, gradually increasing in height to about middle of spinous dorsal fin; profile with slight increase in height at origin of segmented rays. Dorsal-fin spines moderately stout, straight and with pungent tips; all segmented dorsal-fin rays and all except 1st anal-fin ray branched distally. Outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally. Posterior margin of preopercle indistinct, without free margin. No papillae on inner surface of lips. Fifth cranial nerve passes under A1 β section of adductor mandibulae.

Upper jaw extends about half eye diameter behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned. Premaxilla with an outer row of widely spaced conical teeth which become smaller

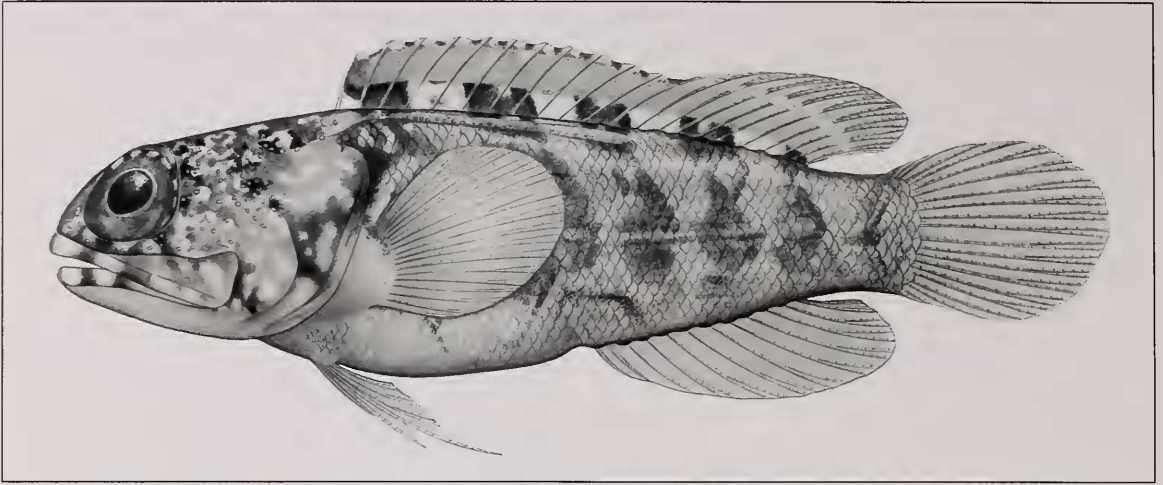


Fig. 11. *Opistognathus crassus*, holotype, BPBM 32706, male, 35.5 mm SL, Maldives Islands, Ari Atoll. (Drawn by Tracy D. Pedersen).



Fig.12. *Opistgnathus crassus*, holotype (John E. Randall).

and more closely spaced posteriorly; 2 inner rows of anterior teeth, those in 1st row much smaller than adjacent outer teeth and innermost teeth increasing in size toward symphysis where 2 or 3 enlarged teeth on each side are canted backwards. Dentary with an outer row of conical teeth, all about the same size and slightly smaller than those of premaxilla; 1-3 inner rows of conical teeth anteriorly, those in innermost row mostly hooked or canted backwards. Vomerine teeth absent. Infraorbital bones relatively slender and open laterally, except for tubular 1st infraorbital (Fig. 2C); 3rd infraorbital somewhat T-shaped with the longest arm projecting posteriorly and without suborbital shelf.

Measurements of the 35.5 mm holotype, as percent of SL: predorsal length 37.9; preanal length 67.0; dorsal-fin base 57.3; anal-fin base 25.5; pelvic-fin length 31.0; caudal-fin length 29.0; depth at anal-fin origin 26.0; caudal-peduncle depth 15.3; head length 38.7; postorbital-head length 22.4; upper-jaw length

23.7; postorbital-jaw length 6.8; orbit diameter 13.4. As percent of head length: postorbital-head length 57.8; upper-jaw length 61.1; postorbital-jaw length 17.4; orbit diameter 34.5.

Preserved colouration of holotype: body primarily light brown interspersed with white on some scales, but mostly white on belly and pectoral-fin base; areas between some body scale rows appear as series of faint narrow brown stripes; head scattered with irregular white spots and a few small dark spots; lips tan with several broad white bands and upper jaw with diagonal white spot; inside of mouth and upper jaw uniformly pale; proximal half of dorsal fin with five evenly spaced, dark, basal blotches (the last blotch much smaller than the others), first blotch (between spines 1-4) with ventral white spot between spines 1-2 and all blotches alternating with sharply defined pale areas nearly as wide as the blotches; blotches 2-4 with small pale spot centered on distal margin; remainder of dorsal fin without

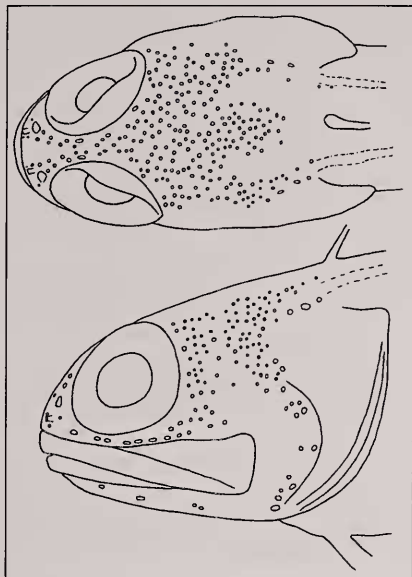


Fig. 13. Cephalic sensory pores (lateral line pores not shown) of *Opisthognathus crassus*, holotype.

conspicuous markings except spine tips with white fleshy tabs; other fins uniformly pale.

Colour of holotype when fresh (Fig. 12): background colour of head and body primarily tan superimposed with irregular white spots and blotches; iris chestnut. Because the fresh holotype was photographed on a black background, some of the more translucent areas of the fins appear darker than they actually are.

DISTRIBUTION. Known only from Ari Atoll, Maldive Islands (Fig. 1) in 35 m.

ETYMOLOGY. The specific epithet is from the Latin *crassus* (thick, fat or stout), in reference to the general appearance of this species.

REMARKS. *Opisthognathus crassus* appears to be closely allied to a triad of disjunctly distributed Indo-West Pacific species (undescribed) that share with it the combination of low meristic values, two supraneural bones, nearly identical infraorbital bones and cephalic pore patterns, stiff dorsal-fin spines tipped with pale fleshy tabs, relatively robust bodies, and colour patterns that include dark blotches along the base of the dorsal fin. The colour pattern of *O. crassus* readily distinguishes it from these allopatric species, especially the relative widths of the dark dorsal-fin blotches and the sharply defined pale interspaces between them.

Opisthognathus dipharus sp. nov.

Tail beacon jawfish

Figs. 14 & 15

Opisthognathus [sic] *muscatensis* (non Boulenger).
Dor, 1970:22 (brief descr.; Red Sea).

Holotype. (only known specimen): HJ 16975, male (47.2), southern Red Sea, Dahlak Archipelago, Um-Aabak, depth not recorded but collected while snorkeling hence probably ≤ 3 m, H. Steinitz, 6 April 1962.

DIAGNOSIS. A species of *Opisthognathus* with the following combination of characters: maxilla rigid without flexible lamina posteriorly; dorsal-fin rays XI, 15; anal-fin rays III, 16; base of caudal fin with pair of conspicuous pale oval spots.

DESCRIPTION. Dorsal-fin rays XI, 15. Anal-fin rays III, 16. Pectoral-fin rays 19. Caudal fin: procurrent rays 5 + 4, segmented rays 8 + 8, middle 12 branched, total elements 25; hypural 5 absent. Vertebrae: 10 + 19; last rib on vertebra 10; epineurals 10. Supraneural bones absent. Gill rakers 10 + 18.

Scales absent from head, nape and body anterior to a vertical from 5th dorsal-fin spine, area above lateral line, pectoral-fin base, breast and anterior

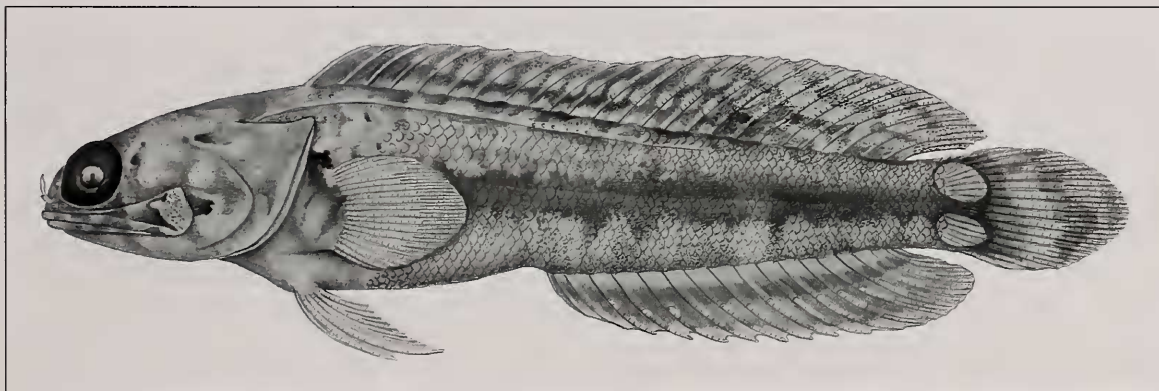


Fig. 14. *Opisthognathus dipharus*, holotype, HJ E62/3685, male, 47.2 mm SL, Dahlak Archipelago, Red Sea. (Drawn by Jack R. Schroeder).

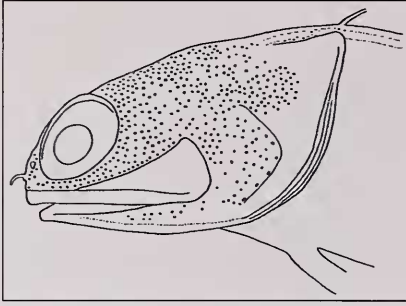


Fig. 15. Cephalic sensory pores (lateral line pores not shown) of *Opistognathus dipharus*, holotype.

one-third of abdomen. Body with about 63 or 64 oblique scale rows in longitudinal series. Lateral-line ends below verticals between 6th and 7th segmented dorsal-fin rays, total element position 17 or 17.5 (left/right sides). Lateral-line pores numerous, arranged in multiple series above and below embedded lateral-line tubes. Cephalic sensory pores numerous (Fig. 15), completely covering most of head, including entire predorsal area except small area immediately adjacent to dorsal-fin origin; dentary pore positions 1-2 with relatively large single pores, 3rd position with 3/3 pores, 4th with 5/6 pores, and 5th with 11/12 pores.

Anterior nostril distinctly closer to posterior nostril than to dorsal margin of upper lip, with simple, flattened tentacle on posterior rim that when depressed reaches margin of orbit; length of tentacle about 3.0 times maximum diameter of posterior nostril. Dorsal fin moderately low anteriorly gradually increasing in height posteriorly; profile relatively uniform with only slight change in fin height at junction of spinous and segmented rays. Dorsal-fin spines relatively slender and curved distally with flexible tips; all segmented dorsal- and anal-fin rays branched distally. Outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradiation membrane incised distally. Posterior margin of preopercle indistinct, without free margin. No papillae on inner surface of lips. Fifth cranial nerve passes under A1 β section of adductor mandibulae.

Upper jaw extends 0.9 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, small and terminally positioned. Premaxilla with moderate, sharply pointed, conical teeth in outer row that become progressively smaller and more closely spaced posteriorly; 2-3 irregular inner rows of much smaller teeth anteriorly, except several somewhat enlarged teeth on each side of symphysis. Dentary with outer row of conical teeth, largest mid-laterally; 2 or 3 inner rows of slightly smaller teeth anteriorly, except several enlarged teeth in innermost row on each side of symphysis. Vomerine teeth absent. Infraorbital bones tubular with wide openings for sensory canals (Fig. 2D), 3rd infraorbital relatively robust with moderate suborbital shelf.

Measurements of the 47.2 mm male holotype, as percent of SL: predorsal length 31.8; preanal length 53.5; dorsal-fin base 70.6; anal-fin base 40.5; pelvic-fin length 19.2; caudal-fin length 21.0; depth at anal-fin origin 16.3; caudal-peduncle depth 9.2; head length 32.4; postorbital-head length 21.7; upper-jaw length 18.1; postorbital-jaw length 8.2; orbit diameter 9.1. As percent of head length: postorbital-head length 67.0; upper-jaw length 55.9; postorbital-jaw length 25.2; orbit diameter 28.1.

Preserved colouration of holotype: most prominent feature is pair of oval-shaped, pale basicaudal spots superimposed against dark background, remainder of caudal fin light brown with indistinct pale bands; head and body various shades of brown, the latter with darker mid-lateral stripe with irregular margins; both lips with dark bands; inner lining of upper jaw and adjacent membranes with posterior black blotch externally visible, remainder of inside of mouth pale except for distinctly brown area next to jaws that extends to beneath middle of orbit; lateral side of posterior end of upper jaw pale, but with adjacent anterior dark blotch and another on cheek that touches margin of jaw; dorsal fin dusky with series of mid-lateral pale spots (about diameter of pupil) present on most spines and anterior soft rays, followed by several narrow, dark, diagonal bands on posterior portion of fin; anal fin with two dusky stripes, the ventral most best developed; pelvic fin with distal half of outer two rays and interradiation membrane pale with remainder of fin brown.

Based on a colour slide of an individual from the Suakin Archipelago (see below), in life the head is tan with the darker markings on upper jaw and cheek rich brown.

DISTRIBUTION. Known only from the southern Red Sea. In addition to the Dahlak Archipelago type locality (16°N, 40°E), this jawfish was photographed by J. E. Randall at Masamirit (18°50'N, 38°46'E), Southern Suakin Archipelago. A single individual was observed in a cove at a depth of 23 m with its head slightly protruding from its burrow. Although collection was unsuccessful, the jaw shape and colour pattern of the head of this jawfish agrees well with the holotype.

ETYMOLOGY. The specific epithet is from the Greek *di* (two, double) and *pharos* (beacon), and refers to the pair of conspicuous pale basicaudal spots against a dark background that characterize this species.

REMARKS. This species is perhaps most closely related to the Indian Ocean *Opistognathus simus*. No trenchant meristic or morphometric differences were found between the two species and they are best distinguished by the basicaudal spots.

***Opisthognathus longinarius* sp. nov.**

Long nostril jawfish

Fig. 16

Holotype. (only known specimen): SAIAB 40331, undetermined sex (41.0), South Africa, kwaZulu-Natal, Kosi mouth area, 26°53' S, 32°55.8' E, dredged in 65 m, R. N. Kilburn, 7 June 1987, R/V Meiring Naude.

DIAGNOSIS. A species of *Opisthognathus* with the following combination of characters: maxilla rigid without flexible lamina posteriorly; dorsal-fin rays X, 20; tentacle on anterior nostril at least 4 times maximum diameter of posterior nostril; oral membrane between dentaries and 'tongue' dark brown.

DESCRIPTION. Dorsal-fin rays X, 20. Anal-fin rays III, 19. Pectoral-fin rays 19. Caudal fin: procurrent rays 5 + 4, segmented rays 8 + 8, middle 12 branched, total elements 25; hypural 5 absent. Vertebrae: 10 + 24; last rib on vertebra 10; epineurals 11. Supraneural bones absent. Gill rakers 8–9 + 15–16 = 23 or 25.

Scales absent on head and body anterior to vertical from 5th dorsal-fin spine, area above and below lateral line, pectoral-fin base and anterior one-third of belly. Body with about 40–42 oblique scale rows in longitudinal series. Lateral line ends below vertical from 8th (right side, left side damaged) segmented dorsal-fin ray, total element position 18. Lateral-line pores numerous, arranged in multiple series along embedded lateral-line tubes. Cephalic sensory pores relatively numerous, completely covering nape; dentary pore positions 1–3 with relatively large single pores, 4th position with 5/5 pores, 5th with 15/15 pores; all preopercular pore positions with multiple pores.

Anterior nostril distinctly closer to posterior nostril than to dorsal margin of upper lip, and with simple tentacle on posterior rim that when depressed extends well beyond orbital margin; length of tentacle at least 4 times maximum diameter of posterior

nostril. Dorsal fin moderately low anteriorly gradually increasing in height posteriorly; profile relatively uniform with slight change in fin height at junction of spinous and segmented rays. Dorsal-fin spines slender and straight or slightly curved distally with flexible tips; all segmented dorsal- and anal-fin rays branched distally. Outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally. Posterior margin of preopercle distinct with free margin. No papillae on inner surface of lips. Fifth cranial nerve passes under A1 β section of adductor mandibulae.

Upper jaw extends about 0.65 eye diameters behind posterior margin of orbit; maxilla widest before end and truncate, without a flexible lamina posteriorly; supramaxilla relatively small and terminally positioned. Premaxilla and dentary with an outer row of relatively small conical teeth followed anteriorly by an inner, irregular row of 2 or 3 teeth. Vomerine teeth absent. Infraorbital bones tubular with wide openings for sensory canals (Fig. 2E), 3rd infraorbital robust and without suborbital shelf.

Measurements of the 41.0 mm holotype, as percent of SL: predorsal length 28.8; preanal length 52.4; dorsal-fin base 67.3; anal-fin base 41.0; pelvic-fin length 18.0; caudal-fin length 22.7; depth at anal-fin origin 13.4; caudal-peduncle depth 7.1; head length 32.0; postorbital-head length 21.1; upper-jaw length 16.3; postorbital-jaw length 6.0; orbit diameter 9.1. As percent of head length: postorbital-head length 66.0; upper-jaw length 51.1; postorbital-jaw length 18.7; orbit diameter 28.6.

Preserved colouration (life colouration unknown): head and body brown with several pale spots along posterior margin of opercle and a pale spot, slightly smaller than pupil diameter, on lower pectoral-fin base and another slightly smaller pale spot at upper margin of pectoral fin; nasal tentacle peppered with large melanophores; inner lining of upper jaw and adjacent membranes with posterior black blotch externally visible; oral membrane from inner margin of dentaries dark brown, remainder

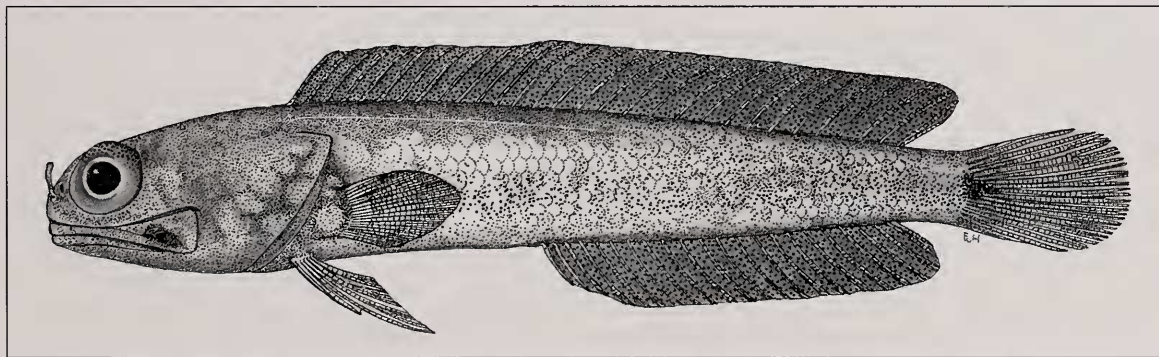


Fig. 16. *Opisthognathus longinarius*, holotype, SAIAB 39747, ? male, 41.0 mm SL, South Africa, Kosi mouth area; based in part on camera lucida drawings of right side of head (reversed) and pectoral-fin base pigmentation (left side). (Drawn by Elaine Heemstra).

of inside of mouth pale; pelvic, dorsal and anal fins uniformly dark brown; caudal fin brown but with darker wedge-shaped basicaudal blotch.

DISTRIBUTION. Known only from off kwaZulu-Natal, South Africa (Fig. 1); the only known specimen was dredged in 65 m.

ETYMOLOGY. A combination of the Latin *longus* (long) and *naris* (nostril) in reference to the length of the nasal tentacle.

REMARKS. The only other jawfish that has the inside of the mouth between the dentaries and 'tongue' brown is *Opistognathus jacksonensis* Macleay, an eastern Australia endemic, but it differs from *O. longinarius* most notably in having vomerine teeth, palmate nasal flap, moderately short and stout dorsal-fin spines, four fewer caudal vertebrae; II versus III anal-fin spines, different distribution and number of body scales; and distinctive colour pattern.

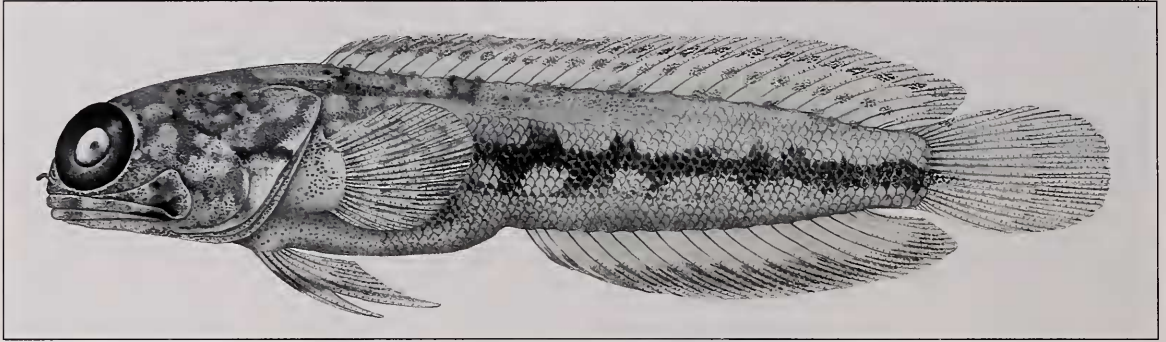


Fig. 17. *Opistognathus simus*, holotype, USNM 315658, female, 66.4 mm SL, Cargados Carajos (= St. Brandon's Shoals). (Drawn by Jack R. Schroeder).

Opistognathus simus sp. nov.

Cargados jawfish
Fig. 17

Holotype. USNM 315658, female (66.4), western Indian Ocean, Cargados Carajos (St. Brandon Shoals), ca. 3.2 km E. of Raphael Island, ca. 16°20'S, 59°38.5'E, 0.2–1.3 m, rotenone, V.G. Springer, C.L. Smith and T.H. Fraser, 3 April 1976, Sta. 76-7.

Paratypes: USNM 315659, male (55.0) and ANSP 167418, female (49.2), same data as holotype.

DIAGNOSIS. A species of *Opistognathus* with the following combination of characters: rigid maxilla without flexible lamina posteriorly; dorsal-fin rays XI, 15; body with about 53–62 oblique scale rows in longitudinal series; scales absent anterolaterally forward of verticals from 5th or 6th segmented dorsal-fin rays; caudal fin without a pair of pale basicaudal spots; vomerine teeth absent.

DESCRIPTION. Dorsal-fin rays XI, 15. Anal-fin rays III, 15 or 16. Pectoral-fin rays 20 or 21. Caudal fin: procurrent rays 5–6 + 4–5, segmented rays 8 + 8, middle 14 branched, total elements 25 or 27; hypural 5 absent. Vertebrae: 10 + 19; last rib on vertebra 10; epineurals 12 or 13. One supraneural bone, inserted between neural spines 1–2. Gill rakers 10 + 17–18.

Scales absent on head, nape and body anterior to verticals from 5th or 6th dorsal-fin spines, area above lateral line, pectoral-fin base, breast and

anterior one-third of abdomen. Body with about 53–62 oblique scale rows in longitudinal series. Lateral-line ends below vertical from 6th segmented dorsal-fin ray, total element position 17. Lateral-line pores numerous, arranged in multiple series above and below embedded lateral-line tubes. Cephalic sensory pores numerous, completely covering most of head, including entire predorsal area except small area immediately adjacent to dorsal-fin origin; dentary pore positions 1–3 with relatively large single pores, 4th position with 3–5 pores, 5th with 8–12 pores.

Anterior nostril distinctly closer to posterior nostril than to dorsal margin of upper lip, and with a simple, flattened tentacle on posterior rim that when depressed reaches margin of orbit; length of tentacle about 1.5 to 2.0 times maximum of diameter of posterior nostril. Dorsal fin moderately low anteriorly gradually increasing in height posteriorly; profile relatively uniform with only slight change in fin height at junction of spinous and segmented rays. Dorsal-fin spines relatively slender and curved distally with flexible tips; all segmented dorsal- and anal-fin rays branched distally. Outermost segmented pelvic-fin ray not tightly bound to adjacent ray, interradial membrane incised distally. Posterior margin of preopercle indistinct, without free margin. No papillae on inner surface of lips. Fifth cranial nerve passes under A1 β section of adductor mandibulae.

Upper jaw extends 0.6 to 0.7 eye diameters behind posterior margin of orbit; maxilla widest at end and truncate, without flexible lamina posteriorly; supramaxilla present, small and terminally

positioned. Premaxilla with moderate, sharply pointed, conical teeth in outer row that become progressively smaller and more closely spaced posteriorly; 2–3 irregular inner rows of much smaller teeth anteriorly, except several somewhat enlarged teeth on each side of symphysis. Dentary with outer row of conical teeth, largest mid-laterally; 2 or 3 inner rows of slightly smaller teeth anteriorly, except 3 or 4 teeth in innermost row on each side of symphysis somewhat enlarged but not canted backwards. Vomerine teeth absent. Infraorbital bones tubular with wide openings for sensory canals (Fig. 2H), 3rd infraorbital robust with moderate suborbital shelf.

Measurements of two paratypes, 49.2–55.0 mm, and the 66.4 mm holotype (in parentheses), as percent of SL: predorsal length 32.0, 32.0 (32.1); preanal length 55.5–57.3 (58.6); dorsal-fin base 70.6–71.5 (67.3); anal-fin base 38.6–41.1 (39.8); pelvic-fin length 20.2–21.5 (19.6); caudal-fin length 21.2–21.3 (20.0) (20.0); depth at anal-fin origin 14.6–15.1 (15.4); caudal-peduncle depth 7.8–8.2 (7.9); head length 32.6–34.2 (32.2); postorbital-head length 22.0–22.4 (20.5); upper-jaw length 17.8–18.5 (18.1); postorbital-jaw length 6.1–7.6 (7.1); orbit diameter 10.2–10.4 (9.6). As percent of head length: postorbital-head length 65.3–67.6 (63.6); upper-jaw length 54.0–54.8 (56.1); postorbital-jaw length 17.8–23.2 (22.0); orbit diameter 29.7–31.8 (29.9).

Preserved colouration (life colouration unknown): head and body various shades of brown; head mottled with several indistinct pale spots and a few scattered dark specks; lips with faint bands and inner lining of upper jaw and adjacent membranes

with posterior black blotch externally visible (Fig. 7B); inside of mouth pale; body with irregular dark, mid-lateral stripe bordered above and below by adjacent series of faint large pale spots and about 7–9 small, pale brown spots evenly spaced along base of dorsal fin; dorsal fin pale except for narrow submarginal stripe below which is another series of small, dusky spots on spines and rays extending from distal third of fin anteriorly to middle of fin posteriorly; other fins pale except anal fin with about distal third of fin dusky.

DISTRIBUTION. Known only from Cargados Carajos [= St. Brandon Shoals] (Fig. 1) in about 1 m depth.

ETYMOLOGY. The specific epithet, from the Latin *simus* (pugnosed), refers to the blunt snout.

ACKNOWLEDGMENTS

Specimen loans and other curatorial assistance were facilitated by P. C. Heemstra (SAIAB), D. Golani (HUJ), J. E. Randall (BPBM), V. G. Springer and J. T. Williams (USNM), and R. Winterbottom (ROM). Colour photographs were kindly provided by R. T. Bryant, P. C. Heemstra and J. E. Randall. Thanks are also due H. L. Jelks (U.S. Geological Survey, Gainesville) for help with several figures and S. J. Raredon (USNM) for digital specimen photographs that aided with some of the cephalic pore drawings. The manuscript was critically reviewed by J. T. Williams.

Table 2. Frequency distribution of fin-ray counts and caudal vertebrae in selected Indo-Pacific species of *Opisthognathus*.

Species	Dorsal-fin spines and rays											Anal-fin spines and rays											Caudal vertebrae											
	X	XI	11	12	13	14	15	16	17	18	19	20	II	III	10	11	12	13	14	15	16	17	18	19	16	17	18	19	20	21	22	23	24	
<i>crassus</i>	1	1											1		1											1								
<i>adelus</i>	6			1	5								6			1	5									1	5							
<i>afer</i>	6			5	1								6		1	4	1									5	1							
<i>dipharus</i>	1						1						1							1											1			
<i>simus</i>	3						3						3				2	1												3				
<i>longinarus</i>	1										1		1																				1	

Species	Total Pectoral-fin rays				Total caudal-fin rays									
	36	37	38	39	40	Procurent			Branched rays					
						6	7	8	9	10	11	12	13	14
<i>crassus</i>					1							1		
<i>adelus</i>		4	1	1		1		3					1	3
<i>afer</i>			2		3			2	2	2			3	1
<i>dipharus</i>			1					1					1	
<i>simus</i>					3			1		2				3
<i>longinarus</i>					1			1					1	

Species	Upper gill rakers				Lower gill rakers									
	8	9	10	11	14	15	16	17	18	19	20	21	22	23
<i>crassus</i>				1										1
<i>adelus</i>		4				1	3							
<i>afer</i>	6				2	4								
<i>dipharus</i>			1							1				
<i>simus</i>			3					1	2					
<i>longinarus*</i>	1	1				1	1							
	Total gill rakers													
Species	22	23	24	25	26	27	28	29	30	31	32	33	34	
<i>crassus</i>														1
<i>adelus</i>			1	3										
<i>afer</i>	2	4												
<i>dipharus</i>							1							
<i>simus</i>						1	2							
<i>longinarus*</i>		1	-	1										

Table 4. Oblique scale rows in horizontal series in selected Indo-Pacific species of *Opistognathus*. (Asterisks indicate bilateral counts were made).

Species	40	42	44	46	48	50	52	54	56	58	60	62	64
	41	43	45	47	49	51	53	55	57	59	61	63	
<i>crassus*</i>				2									
<i>adelus*</i>	8	1	1										
<i>afer</i>								3	-	1			
<i>dipharus*</i>											1	1	
<i>simus*</i>					1	1	-	2	1	1			
<i>longinarus</i>	1												

Table 3. Gill raker counts in selected species of *Opistognathus* (Asterisks indicate bilateral counts were made).

Table 5. Lateral line terminus in relation to segmented dorsal-fin ray position in selected Indo-Pacific species of *Opistognathus*. (Asterisks indicate bilateral counts were made).

Species	Lateral-line terminus position							
	2	3	4	5	6	7	8	
<i>crassus*</i>	2							
<i>adelus*</i>		5	2					
<i>afer*</i>	3	4	5					
<i>dipharus*</i>					1	1		
<i>simus</i>					3			
<i>longinarus</i>								1

LITERATURE CITED

- BOULENGER, G. A. 1887. An account of the fishes obtained by Surgeon-Major A.S.G. Jayakar at Muscat, east coast of Arabia. *Proceedings of the Zoological Society of London*, 1887: 653-667.
- DOR, M. 1970. Nouveaux poissons pour la faune de la Mer Rouge. *Bulletin Sea Fisheries Research Station, State of Israel* 54: 7-28.
- JORDAN, D.S. & W.F. THOMPSON. 1913. Notes on a collection of fishes from the island of Shikoku in Japan, with a description of a new species, *Gnathypops iyonis*. *Proceedings of the United States National Museum* v. 46 (no. 2011): 65-72.
- KLAUSEWITZ, W. 1985. Fische aus dem Roten Meer. XVII. A new species of the genus *Stalix* from the Gulf of Aqaba, Red Sea (Pisces: Teleostei: Perciformes: Opistognathidae). *Revue Francaise d'Aquariologie* 12(1): 17-22.
- NORMAN, J.R. 1939. Fishes. *The John Murray Expedition 1933-34, Scientific Reports* 7 (1): 1-116.
- RANDALL, J.E. & ANDERSON, R.C. 1993. Annotated checklist of the epipelagic and shore fishes of the Maldive Islands. *J.L.B. Smith Institute of Ichthyology Ichthyological Bulletin* 59: 1-49.
- RÜPPELL, E. 1830. *Atlas zu Reisen im nördlichen Afrika. Fische des Rothen Meeres* 16: 95-118, Frankfurt-am-Main.
- SARUWATARI, T., LOPEZ, J. A. & PIETSCH, T. W. 1997. Cyanine blue: a versatile and harmless stain for specimen observation. *Copeia* 1997(4): 840-841.
- SMITH-VANIZ, W.F. 1983. *Opistognathus margaretae*, a new species of jawfish (Perciformes: Opistognathidae) from the Indian Ocean, with notes on *O. nigromarginatus* Rüppell and *O. muscatensis* Boulenger. *J.L.B. Smith Institute of Ichthyology, Special Publication* 30: 1-10.
- SMITH-VANIZ, W.F. 1989. Revision of the jawfish genus *Stalix* (Pisces: Opistognathidae), with descriptions of four new species. *Proceeding of the Academy of Natural Sciences of Philadelphia* 141: 375-407.
- SMITH-VANIZ, W.F. 2009. Three new species of Indo-Pacific jawfishes (*Opistognathus*: Opistognathidae), with the posterior end of the upper jaw produced as a thin flexible lamina. *Aqua, International Journal of Ichthyology* 15(2): 69-108.